

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1 – 3. (canceled)

4. (currently amended) An optical node comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein when an optical node device, being a source of a setting request for an optical path, is the source node, an optical node device at an end point of the optical path is the destination node, and the optical path is bi-directional, an optical path directed away from the source node toward the destination node is defined as a downstream optical path, and an optical path directed away from the destination node toward the source node is defined as an upstream optical path, and when the optical path is a bi-directional optical path, the determining unit is provided with a unit which

decides, at the time that a bi-directional path setting is signaled, which optical node device implements 3R relay in both the downstream optical path and the upstream optical path.

5. (canceled)

6. (previously presented) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein an optical node device at a start point of the 3R section is defined as a 3R source node, an optical node device at an end point of the 3R section is defined as a 3R destination node, an optical node device, being a source of a setting request for an optical path, is defined as a source node, and an optical node device at an end point of the optical path is defined as the destination node, and

when one optical node device is a 3R source node of any one of a plurality of different 3R sections overlapping on an optical path that passes through the one optical

node device, and the one optical node device is not a 3R source node or 3R destination node of other 3R sections,

the determining unit is provided with:

a comparing unit which compares the number of 3R relay implementations for both the case where the one optical node device functions as a 3R source node and where the one optical node device does not function as a 3R source node, with reference to the 3R section information related to an optical path from the one optical node device to the destination node; and

a unit which, when the number of 3R implementations in the case where the one optical node device functions as a 3R source node is less than the number of 3R implementations in the case where the one optical node device does not function as a 3R source node, decides that the one optical node device is an optical node device that implements 3R relay based on a comparison result from the comparing unit.

7. (canceled)

8. (currently amended) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein an optical node device, being a source of a setting request for an optical path, is defined as a source node, and an optical node device at an end point of the optical path is defined as a destination node,

the storing unit stores, as the 3R section information, 3R section information relating to only nodes from a source node to one optical node device, and

when the one optical node device is an optical node device corresponding to a 3R destination node, and is not a destination node,

the determining unit is provided with a unit which decides that the one optical node device is an optical node device that implements 3R relay by using the one optical node device as a 3R source node, and a next hop optical node device as a 3R destination node.

9. (canceled)

10. (previously presented) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein an optical node device at a start point of the 3R section is defined as a 3R source node, and

when one optical node device does not belong to any one of 3R sections having a 3R source node on an optical path that passes through the one optical node device,

the determining unit is provided with a unit which decides that the one optical node device is an optical node device that implements 3R relay by using the one optical node device as a 3R source node, and a next hop optical node device of the one optical node device as a 3R destination node.

11. (canceled)

12. (currently amended) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs;

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information; and

a unit which, when one optical node device is a 3R source node in an upstream optical path, and is not a destination node, and the one optical node device is not a 3R destination node in the upstream optical path, transmits a message in order to transmit information to a previous hop optical node device in the upstream optical path that the previous hop optical node device is a 3R source node which uses the one optical node device as a 3R destination node,

wherein the storing unit stores, as the 3R section information, only information of a 3R section in which the one optical node device is a 3R source node or a 3R destination node, and

the determining unit is provided with a unit which decides that the optical node device itself is a 3R source node in the upstream optical path with an optical node device which has sent the message as a 3R destination node when the optical node device itself receives the message in the upstream optical path.

13. (canceled)

14. (currently amended) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is

possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

- a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

- a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

- wherein an optical node device at a start point of the 3R section is defined as a 3R source node, and an optical node device at an end point of the 3R section is defined as a 3R destination node,

- the storing unit stores, as the 3R section information, only information of a 3R section in which the optical node device itself is a 3R source node, and

- when the optical node device itself is not a destination node on receiving a message, contained in a setting request for an optical path, indicating that the optical node device itself is a 3R destination node, the determining unit refers to the storing unit, and when the optical node device itself is a 3R source node in the optical path, determines that the optical node device itself is an optical node device that implements 3R relay, and transmits a message to an optical node device, corresponding to a 3R destination node of a 3R section in an optical path in which the optical node device itself is a 3R source node, in order to transmit that the optical node device corresponding to the 3R destination node is a 3R destination node.

15. (original) An optical node device according to claim 14, further comprising a unit which, when the optical node device itself is not a destination node on receiving the message, contained in the setting request for the optical path, indicating that the optical node device itself is the 3R destination node, refers to the storing unit, and when the optical node device itself is not a 3R source node in the optical path, determines that the optical node device itself is an optical node device that implements 3R relay as a 3R source node using a next hop optical node device as a 3R destination node, and transmits a message to the next hop optical node device in order to transmit that the next hop optical node device is a 3R destination node.

16. (currently amended) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein an optical node device at a start point of the 3R section is a 3R source node, an optical node device at an end point of the 3R section is a 3R destination node, an optical node device, being a source of a setting request of an optical path, is a

source node, an optical node device at an end point of the optical path is a destination node, and the optical path is a bi-directional optical path, an optical path directed away from the source node toward the destination node is defined as a downstream optical path, and an optical path directed away from the destination node toward the source node is defined as an upstream optical path,

the storing unit stores, as the 3R section information, only information of a 3R section in which the optical node device itself is a 3R source node or a 3R destination node,

the determining unit is provided with: a unit which, when the optical node device itself is not a destination node on receiving a message, contained in an optical path setting request, indicating that the optical node device itself is a 3R destination node in the downstream optical path, refers to the storing unit, and when the optical node device itself is a 3R source node in the downstream optical path, determines that the optical node device itself is an optical node device that implements 3R relay, and transmits a message to an optical node device corresponding to a 3R destination node of a 3R section in the downstream optical path in which the optical node device itself is a 3R source node, in order to transmit that the optical node device corresponding to the 3R destination node is a 3R destination node; and

a unit which determines that the optical node device itself is an optical node device that implements 3R relay in the upstream optical path on receiving a message, contained in an optical path setting request, indicating that the optical node device itself is a 3R source node in the upstream optical path and which, when the optical node device itself is not a destination node, refers to the storing unit, and when the optical

node device itself is a 3R destination node in the upstream optical path, transmits a message to an optical node device corresponding to a 3R source node in the upstream optical path in which the optical node device itself is a 3R destination node, in order to transmit that the optical node device corresponding to the 3R source node is a 3R source node.

17. (original) An optical node device according to claim 16, further comprising:

a unit which, when the optical node device itself is not a destination node on receiving the message, contained in the optical path setting request, indicating that the optical node device itself is the 3R destination node in the downstream optical path, refers to the storing unit, and when the optical node device itself is not a 3R source node in the downstream optical path, determines that the optical node device itself is an optical node device that implements 3R relay using the optical node device itself as a 3R source node and a next hop optical node device in the downstream optical path as a 3R destination node, and transmits a message to the next hop optical node device in order to transmit that the next hop optical node device is a 3R destination node of the optical node device itself; and

a unit which determines that the optical node device itself is an optical node device that implements 3R relay in the upstream optical path on receiving the message, contained in the optical path setting request, indicating that the optical node device itself is the 3R source node in the upstream optical path, and which when the optical node device itself is not a destination node, refers to the storing unit, and when the optical

node device itself is not a 3R destination node in the upstream optical path, transmits a message to a previous hop optical node device in the upstream optical path, in order to transmit that the previous hop optical node device is a 3R source node using the optical node device itself as a 3R destination node.

18 – 23. (canceled)

24. (previously presented) An optical node device comprising a switching unit that switches an optical signal, wherein a preset section in which data transmission is possible without 3R (Reshaping, Retiming, and Regeneration) relay is defined as a 3R section, the optical node device comprising:

a storing unit which stores 3R section information corresponding to topology information of an optical network to which the optical node device itself belongs; and

a determining unit which determines autonomously whether the optical node device itself is an optical node device that implements 3R relay when setting an optical path passing through the optical node device itself, with reference to the 3R section information stored in the storing unit which stores the 3R section information,

wherein an optical node device at a start point of the 3R section is defined as a 3R source node, an optical node device at an end point of the 3R section is defined as a 3R destination node, an optical node device, being a source of a setting request for an optical path, is defined as a source node, and an optical node device at an end point of the optical path is defined as a destination node,

the storing unit stores, as the 3R section information, information of the number of hops H between the optical node device itself and a 3R destination node in a 3R section to which the optical node device itself belongs, and

wherein the determining unit determines that 3R relay of an optical signal transmitted from a 3R source node in the 3R section to which the optical node device itself belongs is implemented, if $T > TH_T$, and $H < TH_H$, where T is the number of 3R trunks that the optical node device itself has, TH_T is a threshold value of the number of vacant 3R trunks, and TH_H is a threshold value of the number of hops up to the 3R destination node.

25 – 34. (canceled)

35. (previously presented) An optical node device according to claim 24, wherein the setting request for the optical path contains labels for specifying wavelengths to be used in order from the source node at the time of switching from the source node to the destination node, and the labels are deleted one by one each time a wavelength is set,

the switching unit is provided with a wavelength conversion unit or a 3R relay unit, and

the determining unit determines that 3R relay of an optical signal transmitted from a 3R source node in the 3R section to which the optical node device itself belongs is implemented if $T > TH_T$ and ($H < TH_H$ and $L < TH_L$), where T is the number of wavelength conversion trunks provided in the wavelength conversion unit or the number

of the 3R trunks provided in the 3R relay unit, TH_T is a threshold value of the number of vacant wavelength conversion trunks or the number of vacant 3R trunks, L is the number of remaining labels, and TH_L is a threshold value of the number of the remaining labels.

36. (previously presented) An optical node device according to claim 24, wherein the setting request for the optical path contains labels for specifying wavelengths to be used in order from the source node at the time of switching from the source node to the destination node, and the labels are deleted one by one each time a wavelength is used,

the switching unit is provided with a wavelength conversion unit or a 3R relay unit, and

the determining unit determines that 3R relay of an optical signal transmitted from a 3R source node in the 3R section to which the optical node device itself belongs is implemented if $T > TH_T$ and ($H < TH_H$ or $L < TH_L$), where T is the number of wavelength conversion trunks provided in the wavelength conversion unit or the number of the 3R trunks provided in the 3R relay unit, TH_T is a threshold value of the number of vacant wavelength conversion trunks or the number of vacant 3R trunks, L is the number of remaining labels, and TH_L is a threshold value of the number of the remaining labels.

37. (original) An optical node device according to claim 35 or claim 36, further comprising a unit which determines that the optical node device itself does not

implement 3R relay regardless of a result determined by the determining unit when the optical node device itself belongs to a 3R section in which a 3R destination node is the destination node.

38. (previously presented) An optical node device according to claim 24, wherein when the optical path is bi-directional, an optical path directed away from the source node toward the destination node is defined as a downstream optical path, and an optical path directed away from the destination node toward the source node is defined as an upstream optical path,

the setting request for the optical path contains labels for specifying wavelengths to be used in order from the source node at the time of switching from the source node to the destination node, and the labels are deleted one by one each time a wavelength is set,

the switching unit is provided with a wavelength conversion unit or a 3R relay unit,

the storing unit stores information of the number of hops H between the optical node device itself and a 3R destination node of a 3R section to which the optical node device itself belongs in the upstream optical path, and

the determining unit determines that 3R relay of an optical signal transmitted from a 3R source node in the 3R section to which the optical node device itself belongs in the upstream optical path is implemented if $T > TH_T$ and ($H < TH_H$ and $L > TH_L$), where T is the number of wavelength conversion trunks provided in the wavelength conversion unit or the number of the 3R trunks provided in the 3R relay unit, TH_T is a

threshold value of the number of vacant wavelength conversion trunks or the number of vacant 3R trunks, L is the number of remaining labels, and TH_L is a threshold value of the number of the remaining labels.

39. (previously presented) An optical node device according to claim 24, wherein when the optical path is bi-directional, an optical path directed away from the source node toward the destination node is defined as a downstream optical path, and an optical path directed away from the destination node toward the source node is defined as an upstream optical path,

the setting request for the optical path contains labels for specifying wavelengths to be used in order from the source node at the time of switching from the source node to the destination node, and the labels are deleted one by one each time a wavelength is set,

the switching unit is provided with a wavelength conversion unit or a 3R relay unit,

the storing unit stores information of the number of hops H between the optical node device itself and a 3R destination node of a 3R section to which the optical node device itself belongs in the upstream optical path, and

the determining unit determines that 3R relay of an optical signal transmitted from a 3R source node in the 3R section to which the optical node device itself belongs in the upstream optical path is implemented if $T > TH_T$ and ($H < TH_H$ or $L > TH_L$), where T is the number of wavelength conversion trunks provided in the wavelength conversion unit or the number of the 3R trunks provided in the 3R relay unit, TH_T is a

threshold value of the number of vacant wavelength conversion trunks or the number of vacant 3R trunks, TH_H is a threshold value of the number of hops up to the 3R destination node, L is the number of remaining labels, and TH_L is a threshold value of the number of the remaining labels.

40. (original) An optical node device according to claim 38 or claim 39, further comprising a unit which determines that the optical node device itself does not implement 3R relay regardless of a result determined by the determining unit when the optical node device itself belongs to a 3R section in which a 3R destination node is the destination node.

41 – 88. (canceled)